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The Accuracy of Equity Valuation using Price-Earnings Multiple for UK Buyouts.

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Abstract

Equity valuation using P/E multiples is widely used globally across all investment banks primarily to assist their clients, advising them whether to purchase or sell a business or to raise capital for growing a business. The success of any business deal critically depends on valuation. Accurate valuation, thus, interests most of the analysts/investment bankers. Despite such wide and critical usage there is limited research around the topic. Literature suggests that researchers have estimated the accuracy of this technique but their work is limited to a few markets and some specified intervals of time. The results they come up with should not be generalized to all markets that exist around the globe rather should be empirically tested on other markets as well. With a little empirical evidence on the effectiveness of P/E equity valuation method as far as international equity markets are concerned, this report adds to its empirical evidence for UK buyouts. This report estimates accuracy of valuation using P/E multiple, constructed both with forward and trailing earnings and finds out whether there is any significant difference between the two. Further, the report analyzes how valuation accuracy varies with target firm size. It contributes to the ongoing research on valuation by providing an estimate of P/E valuation technique for UK markets. The results produced are useful for UK investment bankers and practitioners who deal with equity valuations. The results also have implications for further research around the topic.

Contents

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1.0 Introduction

The aim of this study is to estimate the accuracy of P/E multiple valuation technique for successful UK buyouts' equity valuation. While there are many methods to estimate the equity of a firm, Price-to-Earnings (P/E) multiples is the most common and widely used across areas involving initial public offerings, employee stock ownership plans, estate settlements, tax and corporate restructurings (e.g., mergers and divestitures). Multiples are used primarily because they are simple to comprehend and communicate. Other widely renowned methods for business equity valuation include Discounted Cash Flow (DCF) method, which requires too many years of forecast of free cash flows to equity along with cost of equity estimates. Estimating cost of equity further requires an estimate of firm betas to predict firm risk relative to market. Unfortunately, such information is difficult to gather or produce. Analysts across the globe prefer valuation of buyouts using P/E multiples primarily because unlike DCF, it does not require heavy forecasts. For these reasons, I chose to estimate accuracy of this technique.

The P/E valuation technique involves valuation using market sentiments for comparable firms. The underlying principle is that at one point in time, market has same sentiments for firms facing similar business risk and generating similar returns (Damodaran, 2000). Such firms share common P/E multiple. We can easily value the equity of the target[1] firm by multiplying its earnings with the P/E multiple derived from its comparable[2]. This technique, requiring only the identification of close comparables, becomes relatively easier than DCF both in terms of application and usage. Moreover, accurate valuation is the key to deal success. It is, therefore, very critical part of investment banking sector. Across the globe, analysts use this technique widely to

[1] Target firm is defined as the firm to be valued.

[2] Comparable group is the bunch of firms that are involved in same economic activity as that of the target. There are other restrictions as per risk and return faced. These are elaborated in methodology section, later in this report.

estimate equity valuations. While multiples are tested extensively in practice, there is little published research in the academic literature documenting specifically the P/E multiples for valuation of equity.

Literature suggests that researchers have estimated the accuracy of this technique but their work is limited to a few markets and some specified intervals of time. The results they come up with should not be generalized to all markets that exist around the globe rather they should be empirically tested on other markets as well. With a little empirical evidence on the effectiveness of P/E equity valuation method as far as international equity markets are concerned, this report will add to its empirical evidence for UK buyouts. As of now, much of the evidence on equity valuation methods is from the relatively deep and liquid markets in the USA (e.g., Alford, 1992; Kaplan and Ruback, 1995; and Kim and Ritter, 1998). There is even little evidence for the effectiveness of valuation using target firm's forecasted P/E multiple over that using comparable firm's historic P/E multiples (Liu et al., 2002 and Yong, 2006). The prime reason for limited research is the difficulty in gathering the forecast data for the firms. The project, as the specified aim suggests, adds to the ongoing research regarding P/E method of valuing equity. This project has implications for further research in this area and will help investment analysts who are working in the UK markets to have more insight in to the accuracy and effectiveness of a frequently used valuation technique. The technique is frequently used because of its simplicity. Unlike the discounted dividend and cash flow methods, simple multiple valuation does not require detailed multi-year forecasts of profitability, growth, and the cost of equity. P/E multiples used for this valuation technique can be constructed with either forecasted or historical earnings. It is possible to estimate target's stock price using both of them (Damodaran, 2002). Each estimate has its own accuracy. This study conducts tests using both the methods and identifies the best among them. This report also attempts to empirically study the variation of valuation error with the target firm's size. The task has been accomplished by estimating

the relative proximity of predicted stock price to its actual value (error[3]) for both the approaches under the assumption that UK markets are efficient. In the efficient market, stock prices quickly and accurately reflect all the fundamental information (Fama, 1970). Valuation using market price, therefore, can be chosen as basis of comparison to estimate the error in valuation using P/E multiples. To accomplish the task, I divide the aim into four stages:

1. Estimate accuracy of valuation technique using P/E based on forecast earnings.
2. Estimate accuracy of valuation technique using P/E based on trailing/historical earnings.
3. Estimate whether the above techniques vary significantly to investigate their relative accuracy.
4. Study the variation of error with target's size for both scenarios described above.

To accomplish the first stage of task, five years (2001-05) of UK buyout data is identified. The List of buyouts along with the offer documents is obtained. All relevant forecast data is gathered from either offer documents or Datastream (Adv 4.0). Using above gathered forecast data, the error is computed for each buyout firm. This process generates a list of errors, which is further worked upon conducting parametric statistical tests. A list of values including mean error, median error, coefficient of variation and inter quartile range for absolute errors are calculated and reported as descriptive statistics. These statistics are calculated for each year of the selected window as well as the entire five-year window.

For the second stage of the task, comparable firms from the same industry, defined by primary SIC, as that of the target are identified (Alford, 1992). It ensures that comparable firms perform similar economic activities to those by the target. Further

[3] Error is defined as mean absolute proportional error, defined separately, for each valuation technique in the Methodology section of this report.

filtering of identified firms based on ROE of target firm is done to obtain most close group (3 comparable firms) in terms of risk and return (McNamara, 2000). All relevant historical accounting measures are gathered from FAME and the process to calculate descriptive statistics, conducted for stage 1, is repeated. Similar statistical figures are recorded year-wise and for the list as a whole. Third stage requires hypothesis testing using a non-parametric statistical test. I use the Paired t-test to evaluate any significant variation in the mean error of the techniques reported above. For fourth stage, sample list is divided into deciles based on firm size. Mean errors are calculated for all deciles (Alford, 1992) and analyzed to understand the relation of the firm size with error. Finally, P/E valuation mean errors of deciles are plotted against mean size of deciles to study the variation of error with the firm's size.

Running tests through all the stages, I conclude some vital implications for practitioners and investment banking analysts working in the UK market. Firstly, I confirm that forward earnings contain considerably more value-relevant/incremental information over historical data, and they should be used as long as earnings forecasts are available. Secondly, there is a negative variation of mean absolute error with size of the target firm. Moreover, the error sensitivity is higher for small size firms. Since small size firms are most sensitive, they should be treated with utmost care while selecting comparable firms. Thirdly, forward earnings measures describe actual stock prices reasonably well for a majority of firms. For example, for valuation with P/E using forecasted earnings, approximately 80% of the firms have absolute pricing errors less than 18 percent. The findings of this paper also have a number of implications for valuation research.

The paper is organized into sections as follows. While section 2 reviews prior research, section 3 provides a discussion on the empirical methods used. Section 3 also covers the data sources used in this study. Further, section 4 reports the results, provides the analysis of results and includes the implications of empirical results and Section 5 concludes the research.

2.0 Empirical Literature and Thesis

Because of P/E valuation's wide and critical usage across major areas in investment banks, there has been a constant research work around this field to test and improve its accuracy. The research has great implications for valuation practitioners. Literature reflects that a lot of researchers have empirically tested accuracy of business valuation using P/E multiples. Following is a review of the same that concludes with the implications of the review for my study.

Empirical research on the P/E valuation method includes Boatsman and Baskin [1981] who test the P/E method using two types of comparable firms from the same industry: (1) a random firm and (2) the firm with the most similar ten-year average growth rate of earnings. They found that valuation errors are smaller when comparable firms are chosen based on similar historical earnings growth (case 1), relative to when they are chosen randomly (case 2). However, they did not conduct formal tests of differences in accuracy. Their tests were restricted to a single year, 1976. Further, while the valuation literature recommends selecting several comparable firms, they used only one comparable firm. Selecting just one comparable firm results in a price prediction with a higher standard error than if several equally comparable firms are identified. LeClair [1990] furthered the research by categorizing earnings so as to use them as selection criterion for identification of comparable firms. He tested the P/E method with comparable firms based on industry and three measures of earnings: current-period earnings, average earnings over two years, and earnings attributable to tangible and intangible assets. He conducted tests with a separate discount rate for each source of earnings. Based on a sample of 1165 firms with positive earnings in 1984, he concluded that average earnings perform best. He did not test for significant differences in accuracy across the three earnings measures. In all the research work of 1980s, P/E of comparable firm was based on historical earnings and current share price of

comparable on the date of valuation. Results shown were statistically descriptive in nature and conclusions were drawn over a sample of firms from a specified exchange for a short duration.

Alford [1992] studied the accuracy of the P/E multiple valuation method on a sample of NYSE, ASE, and OTC firms for the years 1978, 1982, and 1986. Comparable firms were selected on the basis of industry, risk (measured by firm size), and earnings growth, both individually and in pairs. He also examined the effect of adjusting earnings for cross-sectional differences in leverage. In his work, the accuracy of the *P/E* valuation method for each method of selecting comparable firms is assessed by comparison of each firm's predicted stock price with its actual price. The underlying assumption is that, on average, market prices correctly reflect fundamentals. His results suggest that the widespread procedure of selecting comparable firms by industry is relatively effective, where industry is defined by the first three SIC digits. He accepted marginal improvement in accuracy if industry definition was extended to 4 SIC digits. Further accuracy improvement occurs when risk and earnings growth are used together to construct portfolios of comparable firms, although neither variable performs well by itself, and neither variable is marginally useful with industry (Alford, 1992). He found no support for the recommendation to control for differences in leverage since accuracy decreased when *P/E* multiples were adjusted for differences in leverage across comparable firms. Finally, he concludes that valuation accuracy increases with the firm size, and that the efficacy of selecting comparable firms on the basis of industry is greater for large firms than for small firms. He divided his sample in quartiles (based on firm size) to understand the variation of absolute error with firm size. To him, based on his study, industry appeared to be a good surrogate for the component of risk and earnings growth related to P/E multiples (Alford, 1992).

The research work of Kim and Ritter, 1998, was the first of its kind to value IPOs. They conducted accuracy tests on 190 US based private firms that obtained public listing

during 1992-1993. They obtained the comparable firms multiples from two sources: 1) Mechanical program that selected recent IPOs with similar SIC 4 digit codes as a proxy of similar industry; 2) From Renaissance reports (Renaissance is IPO research company in USA). Kim and Ritter estimated the valuation error both in P/E using trailing and forward earnings. They examined errors for 3 different price-levels: a) Preliminary offer price; 2) Final offer price & 3) First closing market price. Investigating the mean absolute errors and their deviations around the mean for all such price levels, they concluded that P/E multiples using forecasted earnings result in much more accurate IPO valuations than multiples using trailing earnings.

Cheng and McNamara (2000) extended valuation tests for multiples beyond P/E. They tested the price-earnings (P/E) and the price-book (P/B) methods for their accuracy. A comparison among P/E, P/B and their combination based on equal weights was also made. The selection of comparable firms was based on industry membership (IND), size in terms of total assets (TA) and return on equity (ROE) as well as combinations of industry membership with TA and ROE. They concluded that for both P/E and P/B valuation methods, the best variable to reflect the comparable company was IND + ROE. However, ROE lost advantage when applied to combination of P/E-P/B approach. They further concluded that for most definitions of comparable firms, P/E benchmark valuation method performs better than the P/B valuation benchmark method. Like Alford, they also concluded that the valuation accuracy increases with firm size. Furthermore, they conclude that valuation accuracy increases with the number of firms representing target firm's industry.

Through 1990s, the major research work was limited to the liquid markets of USA. The research developed through examining the valuation of firm in general to specific firm groups such as young firms raising IPOs (Kim and Ritter, 1998). Research work also developed beyond P/E multiples (Mc Namara, 2000) and superior definitions for comparable firms were sought.

Liu et al., 2002 examined the valuation performance of a comprehensive list of value drivers. He found that multiples derived from forward earnings were remarkable in explaining stock prices. They were better than historical ones. His sample comprised 26613 firms from 1982 to 1999 and represented small fraction of NYSE+NASDAQ+AMAX stock exchanges. Liu statistically tested the data for an estimate of accuracy using traditional multiples valuation approach. He used standard statistical parameters such as mean, median and standard deviation to analyze the data. The results obtained were: 1) Pricing errors found were within 15 percent of stock prices for about half of his sample. 2) In terms of relative performance, the following general rankings were observed consistently each year - forward earnings measure were followed by historical earnings measures, cash flow measures and book value of equity were tied for third and sales performed the worst. 3) Selection of firms from the same industry improved performance for all value drivers. Last result was in line with the work of Alford, 1992 and Cheng and McNamara, 2000.

Yong K. Y. (2006) took the research a step ahead by examining a comprehensive approach over simple multiple valuation techniques. He took a sample from NYSE that had 29,929 observations of 5,741 firms between 1981 and 1999 and tested it for accuracy of valuation using multiples. He also combined several simple multiple valuation outcomes in order to improve the valuation accuracy. He considered linear combination of simple valuation outcomes to conclude that composite approach reduces valuation errors of each simple multiple valuation using a historical multiple. "The practical implication of this result is that when analysts' earnings forecasts are not available, valuation experts should consider various historical multiples simultaneously" (Yong, 2006). Based on his tests he also concluded that the combinations of the valuation outcome of forward earnings multiple and those of historical multiples do not improve the valuation accuracy of the valuation outcome of forward earnings multiple. He argued that his results suggest that almost every bit of information that is captured

by historical earning multiple is also reflected in the forward earning multiple. His results that forward earnings multiples provide the best valuation were in line with Liu's results.

In the past decade, cyber industry developed. Databases such as I/B/E/S, having forecast information for all the firms, came into existence. These databases aided researchers to import forecast data on a large scale to estimate firm values. Its great implications are evident from the conclusions drawn by Liu, 2002 and Yong, 2006. However, both of them conducted their tests on liquid US markets. There is no reason to believe that these results also hold for relatively less liquid markets. Similarly, the results showing variation of valuation error with firm size are limited to US equity markets. This leaves a gap in P/E valuation research for international equity markets and my study being conducted on UK equities partially fills this gap. My research work is to estimate accuracy of P/E valuation technique for UK buyouts. The review conducted in this section has implications for my proposed study. It is closely linked to the research work of Alford (1992) in terms of industry selection criteria for comparable firms. Four-digit primary SIC code is used for selecting similar industry. Further filtering is done on the basis of ROE. It is done in accordance with McNamara (2000) who estimated ROE to be the best surrogate of return for comparable firms. In essence, I use target firm's Industry as proxy for risk and its ROE as proxy for return to get the closest comparable firms in terms of risk and return. The Methodology that I use is consistent with Kim and Ritter, 1998 and Liu, 2002 in that I do analysis of descriptive statistics to conclude my results. In addition, I also use standard paired T-test to find whether there is any statistically significant difference between the errors in valuation techniques. To find out how error varies with target firm's size, I part the sample into deciles based on target size. This approach is direct extension of the approach used by Alford (1992) to use size quartiles to analyze variation. I will conduct tests on a sample of 89 UK buyouts from 2001-2005 to estimate the accuracy of P/E valuation technique. Initial sample size

has been taken to ensure that the results I get are statistically reliable and the window chosen is to ease the availability of data to carry out the required task.

3.0 Data and Methodology

P/E valuation is a subjective approach to value a firm (Koller, 2005). We can, therefore, not limit our analysis to fewer firms. The answer to "How accurate is P/E valuation when compared to market valuation?" can only be provided statistically by calculating the absolute error for every firm in the sample and finding mean absolute error for the technique statistically. The accuracy of my results will depend on the sample size. I have selected a window of 5 (2001-2005) years and have identified the Management Buy-Outs, which were successful during that period in the UK (Appendix 1). Buyouts are selected as every buyout in accompanied with an offer document that contains historic and forecast financials. The sample list has been collected from CMBOR, Nottingham University Business School. The initial identified sample comprises 89 deals. The number of years is chosen to gather enough data to produce statistically viable results. Estimating stock price using P/E multiple raises obvious questions about which stock price and which Earnings (Value Driver) should be used to calculate this ratio. The stock price is always the stock price of the comparable firm on the day of valuation (Palepu, 2000). This ensures that there are similar future exposure/conditions (in terms of macroeconomic factors) both for comparable and the firm to be compared and that there is no bias in the market confidence for either firm. Damodaran (2002) cites the use of both historical and forward earnings for estimating share price. I estimate the share price using both methods to find the better technique out of them. Here onwards, calculation of P/E based on historical earnings will be denoted by $(P/E)_h$ and that based on forward earnings will be denoted by $(P/E)_f$. Similar subscripts (c and f) on the symbols denote their corresponding historical and forward values. Furthermore, any subscript j, used anywhere, would denote that corresponding entity belongs to jth firm.

3.1 Calculation of share price using $(P/E)_f$.

This is the first estimate of share price. Since the company goes from private to public with IPO issue, the relevant decision-making information is provided to interested investors through an offer document, created before the issue. The offer document contains historical and forecasted financial information on the company going public. For every firm j in the sample, P/E based on placing price and forecasted earnings per share $(P/E)_{jf}$ along with forecasted earnings per share $(EPS)_{jf}$ is directly obtained from the offer document for each deal. Careful study of the every offer document reveals that forecast of earnings is based on the historical financials of the company together with its directors' forecast for the leftover year. Forecast of earnings also include principle assumptions common to all the companies in my sample. These are summarized below –

a) Rates of interest, taxation, inflation and foreign currency exchange rates will not change significantly during the forecast period.
b) Any changes in relevant legislation, government policy or other regulatory requirements will not materially affect the results of the group.
c) During the forecast period, there will be no serious industrial disputes or other interruptions in business arising from circumstances outside the group's control adversely affecting the group, its customers or suppliers.
d) During the forecast period, there will be no material adverse change in economic conditions in the markets in which the group operates.

For companies whose offer documents are unavailable, the placing price of ordinary share has been obtained through Reuters Datastream (Adv 4.0). Firms have been excluded for 3 conditions listed below -

1) If the prospectus or listing profile does not provide any forecast income statements.
2) If forecast earnings are negative.
3) If the firm goes for any merger within the forecast horizon.

First condition ensures that the forecast data be obtained. The second condition avoids negative predicted prices, and the third condition ensures that there is no significant change in the industry of the target firm as per SIC codes. With the above criteria, I have scrapped 29 firms from the initial sample. The resulting sample (Appendix 1a), which includes 60 observations between 2001 and 2005, is used for the descriptive statistics reported in table 1. Industry wise breakup and year wise breakup of the 60 observations are presented as below in Table A and Chart A respectively. These are constructed from appendix 1a.

SNo.	Industry	Buyouts
1	Banking, insurance & finance	3
2	Biotechnology	1
3	Business services, leasing	10
4	Computer:Hardware	2
5	Computer:Services	2
6	Computer:Software	5
7	Electrical eng. & Electronics	2
8	Extraction of ore and minerals	1
9	Food	1
10	Hotels, Catering & Leisure	10
11	Leather, footwear & clothing	1
12	Mechanical & instrument eng.	2
13	Media	3
14	Medical:Healthcare	3
15	Medical:Pharmaceutical	2
16	Other manufacturing	1
17	Retail distribution & repair	4
18	Telecommunications	4
19	Transport & communication	2
20	Wholesale distribution	1

Table A : Industry Wise Breakup of the 60 Sample Observations

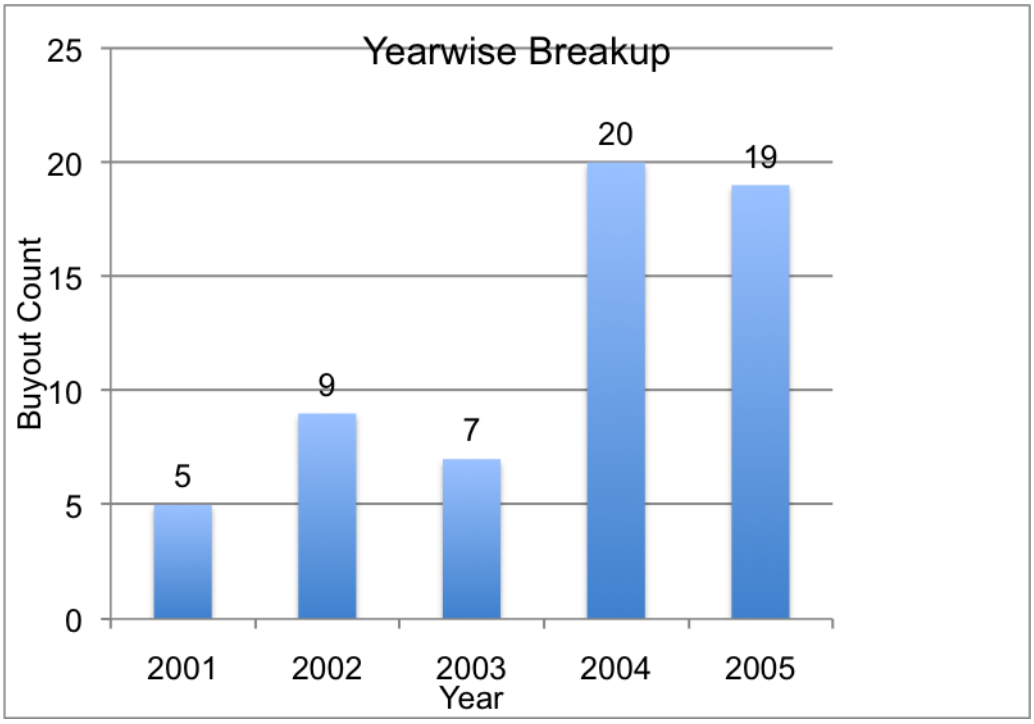


Chart A : Year-Wise Breakup of 60 Sample Observations

In the P/E valuation, the estimate for the stock price is obtained by multiplying a value driver (earnings) to the corresponding multiple, where the multiple is obtained from the ratio of stock price to that value driver for a group of comparable firms (Copeland, 1994). A simple product of $(P/E)_{jf}$ and $(EPS)_{jf}$ leaves us with the predicted price of ordinary share for the firm j (Refer Table-1a). The placing price when multiplied with no. of outstanding shares of the firm j provides the expected market capitalization of the that firm. This value, therefore, can be compared with the real market value captured in the actual share price of the same firm when it actually trades on some exchange. The actual prices for all these firms (after two days of trading) have been obtained from Reuters Datastream (Adv 4.0). I have assumed here that markets correction occurs within the horizon of two days and that on an average, market prices correctly reflect fundamentals.

Further, For every firm j in my sample of 60 firms, I define the difference in the actual share price ($\mathbf{P_{jt}}$) and predicted (Placing Price) as the prediction error in valuation $(PEV)_{jf}$ using $(P/E)_f$ technique.

$$(PEV)_{jf} = P_{jt} - (P/E)_{jf}*(EPS)_{jf}$$

The modulus of prediction error gives the absolute prediction error $(PAE)_{jf}$. Prediction error needs to be scaled to control for the size effect. This is necessary for cross sectional comparisons of the magnitude of prediction errors. Scaling can be done by $\mathbf{P_{jt}}$ to give the proportional predicted error or $(PPE)_{jf}$ (e.g., foster,1977; Bathke, Lorek, and Willinger, 1989). If I use actual price as the scaling factor then the scaled error measurement for over or under predictions will differ for the same absolute prediction errors. The reason is provided as below:

Using actual price as the scaling factor, the $(PPE)_{jf}$ will be $\left| P_{jt} - (P/E)_{jf}*(EPS)_{jf} \right| / P_{jt}$. For any two firms with same predicted price, PPE will be large - on an average - for the one with undervalued stock i.e. lower P_{jt} than the predicted price (McNamara, 2000). Since scaling by actual price favors under-prediction, it is a biased measure for investigating the differences between over and under-prediction cases. In other words, this implies that an asymmetric measure of prediction error exists, which makes sense only if we believe that the utility function of the user of valuation is consistent with the notion that over-prediction is worse than under-prediction. However, we don't have any reasons to believe it. I correct the problem by using predicted price as the scaling factor rather P_{jt}. Now any two firms, whether under or overvalued, with similar predicted prices will have same $(PPE)_f$. For a small sample of 60 firms, I decide go for non-parametric statistical tests. With respect to that, I calculate proportional error for every entry in my data list. Descriptive statistics such as Mean absolute proportional error $\mathbf{(MAPE)_f}$, median proportional error $\mathbf{(MPE)_f}$, standard deviation $\mathbf{(SPE)_f}$ are essential for investigating the absolute accuracy of the technique. To understand the standard deviation of data in the context of the mean of the data, I also calculate the coefficient of variation $\mathbf{(CV)_f}$. To investigate for outliers, I partition the list of absolute errors in quartiles based on the error size. Inter quartile range $\mathbf{(IQR)_f}$ for absolute errors are

calculated so that any outliers, if present, can be identified. The statistical figures are reported in the descriptive statistics Table-1. Further to this, data is segregated year-wise such that all these values are calculated for each individual year starting 2001.

3.2 Calculation of share price using $(P/E)_h$.

This is the second estimate of share price. Firm value can also be calculated using traditional multiple valuation technique which is P/E valuation based on the historical earnings rather forecast earnings as the value driver (Damodaran, 2002). This traditional multiple valuation technique is used by Yong, 2006 and Liu, 2002 to estimate the valuation error in their studies. I have followed the same method for my second estimate of share price. The traditional multiple valuation technique relies on the sample principle that equity value is an increasing function of future payoffs and a decreasing function of risk (Liu, 2002). Both future payoffs and risk are captured in the multiple obtained from comparable group. Liu said that for every firm j from the comparable group, the price (P_{jt}) in year t is directly proportional to the value driver (X_{jt}):

$$\mathbf{P_{jt} = B_t X_{jt} + \varepsilon_{jt} \quad \ldots\ldots\ldots\ldots\ldots\ldots (a)}$$

Where, B_t is the multiple on the value driver (Earnings of firm j) for year t and ε_{jt} is the pricing error of firm j for year t. With the restriction that on an average, pricing errors are zero, Liu estimated B_t to be the harmonic mean of P_{jt}/X_{jt}. He also empirically tested that B_t, calculated using this restriction, generates lower pricing error than if calculated without such restriction. Since the restriction generates lower pricing error, I have used it to evaluate the B_t (same as $(P/E)_h$ in our case) separately for every firm to be valued (target firm). This multiple is then used with corresponding X_{jt} (same as $(EPS)_h$ in our case) to find out the second estimate ($\mathbf{B_t X_{jt}}$) of expected share price (Refer Table-2a). The method resembles to the one used by Alford, 1992 except that he used median P/E

value of the comparable group, arguing that median value is free from the effect of outliers. Instead, I am using the harmonic mean (Liu, 2002) for reasons cited above.

Since B_t depends on P_{jt}/X_{jt} of firms in the comparable group, it becomes very critical to determine the appropriate comparable group. The accuracy of the technique is a function of the selection process for comparable firms. The reason cited in literature is that P/E of comparable firms is very close to that of the firm to be valued. This is attributed to the similar risk and growth faced for same business done by both the firms (Beaver, 1978). Thus, it is desired that comparable group be selected from the same industry (firms into same economic activity/similar business) with firms having close value drivers to that of the firm to be valued. Mc Namara, 2000 used six different criteria for selecting set of comparable firms. As an extension to Alford's conclusion, they concluded that the best variable to reflect the comparable firm with in an industry was ROE. Therefore, I have selected ROE to define the set of comparable firms for calculating share price using $(P/E)_h$.

For identifying the comparable group, we first need to classify the market in to groups that perform similar economic activities. The UK Standard Industrial Classification of Economic Activities (UK SIC (92) has coded UK businesses according to the economic activities they are engaged in. Clarke (1989) reports SICs to be the best delineators of economic markets. Based on the above classification, I select the primary SIC (4-digits) to be the proxy for a particular industry. Appendix-2 provides details of SIC for individual firms in my sample. This is in line with the approach used by Alford (1992) and McNamara (2000) for selecting industry to make a comparable group. I key in the company name from the sample list in FAME to come up with the primary SIC code in which the company falls into. Searching FAME according to the primary SIC produces a list of other companies that have same primary SIC. FAME contains past 10-year company specific data of all UK based firms so we can obtain ROE of entire list for the

buyout year of target firm. This is possible because the buyouts in my sample are from 2001 to 2005, well within the range of FAME database. This list is exported to excel and arranged in ascending order of ROE. A manual identification of 3 companies close to the ROE of target firm is done and corresponding $(P/E)_h$ of these identified companies is calculated using data from FAME (Refer Table-2a). In the calculation, earnings are the historic earnings booked in the previous financial year closest to the time of buyout. If the identified company doesn't have corresponding P/E multiple over FAME then next close company (in terms of ROE) is selected from the exported list. The process is repeated till three P/E values are obtained. The harmonic mean of these three P/E values gives us the value of B_t for the target firm. In line with the definition, the subscript 't' reflects the buyout year of the target. The corresponding value driver $(EPS)_h$ is calculated using the simple division of historical earnings with no. of ordinary shares outstanding as provided in the offer document. Historical earnings selected are the earnings of the past financial year that is closest to the time of buyout. A simple product of B_t with $(EPS)_h$ is the second estimate of share price. This value, therefore, can be compared with the real market value of the actual share price of the same firm when it actually trades on some exchange. The actual prices for all these firms (after two days of trading) have been obtained from Reuters Datastream (Adv 4.0). I have assumed here that markets correction occurs within the horizon of two days and that on an average, market prices correctly reflect fundamentals. The error is then calculated as per equation (a). I define this error as the pricing error in valuation of share price using $(P/E)_h$ technique. The modulus of this error gives the absolute pricing error, which when scaled by predicted price of share price gives the predicted proportional error $\mathbf{(PPE)_h}$. Selecting non-parametric statistical methods, I calculate proportional error for every entry in my data list. Descriptive statistics such as Mean absolute proportional error $\mathbf{(MAPE)_h}$, median proportional error $\mathbf{(MPE)_h}$, standard deviation $\mathbf{(SPE)_h}$ are essential for investigating the absolute accuracy of the method. To understand the

standard deviation of data in the context of the mean of the data, I also calculate the coefficient of variation $\mathbf{(CV)_h}$. To investigate for outliers, I partition the list of absolute errors in quartiles based on the error size. The Inter quartile range $\mathbf{(IQR)_h}$ for absolute errors is calculated so that any outliers, if present, can be identified. The statistical figures are reported in the descriptive statistics (Table-2). Further to this, data is segregated year-wise such that all these values are calculated for each individual year starting 2001.

3.3 Hypothesis Testing

Although we can notice the difference in the mean absolute errors as obtained from absolute testing using methods discussed in the previous section, we don't know how statistically significant the difference is. To evaluate any significant variation in the means of two independent samples, statistics literature highlights the use of hypothesis test. Therefore, I am conducting hypothesis testing using a non-parametric statistical test. This testing is conditional to certain assumptions, which are satisfied in our case. These are discussed as below.

Since the techniques are different, both the populations are different and therefore, samples drawn are independent. In our case, the interval/ratio-level data for both the samples is also same. To evaluate any significant variation in the means of two independent samples, which are randomly drawn from different populations, statistics literature advices to use a paired t-test (Refer Table-3). I have used the same test to investigate any statistically significant difference in the absolute means of both the valuation techniques. For testing purpose, I state the null hypothesis (H_o) as:

H_0 : There is no statistically significant difference between the mean absolute error in valuation using $(P/E)_f$ and the mean absolute error in valuation using $(P/E)_h$.

The alternate hypothesis (H1) will be:

H_1 : There is statistically significant difference between the mean absolute error in valuation using $(P/E)_f$ and the mean absolute error in valuation using $(P/E)_h$.

The rejection criteria have been set at 5% confidence level ($\alpha = 0.05$) and one tail test. I compute t-stat for each year covering all the observations in the sample and overall five-year window. Corresponding p values (based on degrees of freedom of test sample) are obtained from standard t - p conversion table. These are reported in table 4 of the

analysis section. Based on these values, I determine the level of significance both for the window and individual years in accordance with the standard paired t-test with one tail.

3.4 Valuation Error V/S Target Firm Size

The last question deals with the study of the variation of error with the size of comparable firm. I have taken total assets of the firm to be the proxy of its size (Alford, 1992 and McNamara, 2000). The size of firm is the total assets (in Mn GBP), of the target firm, booked in the previous financial year most close to the date of buyout as obtained from Datastream (Adv 4.0). I partition the sample into deciles on the basis of firm size to assess how firm size varies with valuation accuracy (Refer Table-4b and Table-4d). I examine variation by plotting mean valuation error for every decile against the mean total assets of that decile. The process is conducted for both valuation techniques. Mean absolute prediction errors appear in Table-4a & Table-4c for all 10 deciles (6 firms each), covering the full 60 firm sample. Segregating list into deciles based on firm size is done to improve analysis, making it more robust.

4.0 Analysis

4.1 Absolute accuracy of valuation using $(P/E)_f$

First row of Table-1 presents year-wise $(MAPE)_f$. We can notice that the $(MAPE)_f$ figure has shown a consistent trend except in two years. A 50% rise against the overall average in 2003 while a drop of 25% against the same in 2004. Inter year median values $(MPE)_f$ are also consistent apart from those in 2003 & 2004. This implies that analysts' estimates had deviated significantly from average for these two years. The standard deviation $(SPE)_f$ of 0.133 (for 2003) against 0.095 (for overall) suggests a relatively higher variation in 2003. However, looking at standard deviation in the context of mean, we can see higher $(CV)_f$ of 0.943 in 2004 against 0.735 in 2003. The rank order of years based on $(MAPE)_f$ are 3, 2, 5, 1 and 4 for 2001, 2002, 2003, 2004 and 2005 respectively. There were very few buyouts (7) in 2003 as compared to 60 in the sample still 2003 has got a significant $(MPE)_f$ value of 0.206 for 2003. This leads me to a conclusion that most of the outliers should belong to the year 2003. This conclusion is further strengthened when we look at the inter quartile range $(IQR)_f$ of 0.169 for 2003, which is 20% (approx) higher than that for overall.

Buyout year	**2001**	**2002**	**2003**	**2004**	**2005**	**Overall**
$(MAPE)_f$	0.132	0.121	0.180	0.096	0.133	0.124
$(MPE)_f$	0.111	0.109	0.206	0.077	0.104	0.105
$(SPE)_f$	0.060	0.062	0.133	0.090	0.093	0.095
$(CV)_f$	0.459	0.514	0.735	0.943	0.700	0.768
$(IQR)_f$	0.056	0.061	0.169	0.135	0.136	0.139
Buyouts (count)	5	9	7	20	19	60

Table 1 : Descriptive Statistics depicting absolute accuracy for valuation using $(P/E)_f$

Overall statistics reveal that on an average, the absolute pricing error is 12.4% with 10.5% median absolute error. In other words, the predicted prices, on an average, are 87.6% accurate when we use $(P/E)_f$ valuation technique. We can, therefore, say that on an average, this technique is moderately predictive. Forward earnings measures describe actual stock prices reasonably well for a majority of firms. We can notice from Appendix-A that approximately 80% (i.e. 47/60) of the firms have $(PPE)_f$ less than 18 percent. The coefficient of variation $(CV)_f$ of 76.8% for the overall sample indicates that there is a lot of variation. This is also evident from the 12.4% $(MAPE)_f$ with 9.5% $(SPE)_f$ for overall sample as the standard deviation is high in context of the mean. Further, for overall sample the inter-quartile range $(IQR)_f$ of 0.139 for a mean of 0.124 suggests that the middle fifty observations' spread is high. Firm wise analysis is presented in Table 1a. We can identify outliers (year-2003) such as Mechan Controls, Sondex and Sinclair Pharma with $(PPE)_f$ of 24%, 28% and 35% respectively.

Table 1a: Firm wise details of Valuation using $(P/E)_f$
(Data Source: Offer Documents and Datastream)

BUYOUT	Placing Price $(P/E)_{jf}*(EPS)_{jf}$	Market Price after 2 days of listing (P_{jt})	EXIT YEAR	$(PPE)_{jf}$
Capcon	80	90	2001	0.11
Caffe Nero	50	53.5	2001	0.07
OMG	75	83.5	2001	0.10
Parkman Group/Flete Ltd DO NOT CONTACT	125	148.5	2001	0.16
PHS Holdings	93.5	76.5	2001	0.22
Lloyds Equipment Hire/Lloyds British Testing	20.5	23	2002	0.11
Trecco Bay/Premier Dawn/Parkdean Holidays	100	112.5	2002	0.11
Corin Medical	111	129.5	2002	0.14

Smith Group Ltd/Detica	98	78.3	2002	0.25
Inveresk Research	13	11	2002	0.18
Punch Taverns	44.73	47.07	2002	0.05
Testing Services/Intertek	400	433.5	2002	0.08
HMV Media	192	177.5	2002	0.08
William Hill	158.87	174.05	2002	0.09
Mechan Controls	57	75	2003	0.24
Tellings Golden Miller	78	77.5	2003	0.01
Sondex	83	115.86	2003	0.28
Sinclair Pharma	80	122.52	2003	0.35
Center Parcs	83	104.5	2003	0.21
Benfield Lovic & Rees/Benfield	230	280.5	2003	0.18
Yell Group	267.19	267.19	2003	0.00
MKM Marketing & Promotions	36	46.5	2004	0.23
Prologic Computer Consultants	75	84.5	2004	0.11
Immunodiagnostic Systems/IDS	55	55	2004	0.00
Cambridge Display Technology/CDT	11.27	11.57	2004	0.03
SmartFocus	6.34	9.63	2004	0.34
Staffline	72	85.5	2004	0.16
Torex retail business/Lynxangel	55	60.5	2004	0.09
PKL Holdings	102	127.5	2004	0.20
ATH Resources	135.03	137.51	2004	0.02
NCC Group	170	176.5	2004	0.04
Pinewood Studios	180	200.5	2004	0.10
Ratheon Marine/Raymarine	160.5	155	2004	0.04

Phoenix Computers/Phoenix IT Group	200	238.5	2004	0.16
Umbro	100	109.05	2004	0.08
Jessops Limited	145	156	2004	0.07
Dignity Caring Funeral Services/Dignity Services	239.92	243.57	2004	0.01
Xyratex	13.95	14	2004	0.00
Hillsdown/Premier Foods	145.41	148.12	2004	0.02
Halfords	220	265	2004	0.17
Admiral Insurance Services	275	287	2004	0.04
Software Radio technology (SRT)	31	38.5	2005	0.19
NWP Spectrum/Spectrum Interactive	62	94.5	2005	0.34
Caretech	125	169	2005	0.26
Powerleague	48	50	2005	0.04
London Capital Group	85.5	85.5	2005	0.00
Synexus	65	72	2005	0.10
Cyan Technology	22	24.75	2005	0.11
ReNeuron	25	26	2005	0.04
Lombard Medical (Advanced Medical Technologies)	123	163.5	2005	0.25
Sarantel	10.05	11.35	2005	0.11
La Tasca/The Restaurant People Group	110	134	2005	0.18
Hargreaves (UK)	243	246	2005	0.01
Davenham Group Holdings Limited	254	261.5	2005	0.03
Land of Leather	1247.91	1329.74	2005	0.06
Carter & Carter	200	295.5	2005	0.32
SThree/Solutions in Staffing & Software	190	204.5	2005	0.07

IG Group (IGGHL)/IG Index	130	119.75	2005	0.09
Pizza Express (Gondola Express)	270	326	2005	0.17
Inmarsat	245	288	2005	0.15

4.2 Absolute accuracy of valuation using $(P/E)_h$

Yearly $(MAPE)_h$ values presented in table 2 show a smooth trend of average absolute error over years except two extreme years 2003 and 2005. In 2005, the $(MAPE)_h$ value increased to 112% while in 2003, it dropped to 87% of the overall average. Whilst the year-wise order of rank in terms of $(MAPE)_h$ value is 3,2,1,4 and 5 for years 2001, 2002, 2003, 2004 and 2005 respectively.

Buyout year	**2001**	**2002**	**2003**	**2004**	**2005**	**Overall**
$(MAPE)_h$	0.276	0.263	0.254	0.297	0.335	0.297
$(MPE)_h$	0.259	0.183	0.221	0.210	0.271	0.232
$(SPE)_h$	0.191	0.258	0.204	0.231	0.190	0.212
$(CV)_h$	0.691	0.982	0.805	0.779	0.566	0.713
$(IQR)_h$	0.023	0.146	0.171	0.114	0.164	0.146
Buyouts (count)	5	9	7	20	19	60

Table 2 : Descriptive Statistics depicting absolute accuracy for valuation using $(P/E)_h$

The standard deviation $(SPE)_h$ of 0.258 (for 2002) against 0.212 (for overall) suggests a relatively higher variation in 2002. Moreover, looking at the standard deviation in the context of mean, we can see higher $(CV)_h$ of 0.982 for 2002 against that of 0.713 for overall, strengthening the conclusion that the year 2002 has relatively higher variation than the overall sample. There were very few buyouts (9) in 2002 as compared to 60 in the sample, still 2002 has got a significant $(MPE)_h$ value of 0.256. This leads me to a conclusion that most of the outliers should belong to the year 2002. This conclusion is

further strengthened when we look at the inter quartile range $(IQR)_h$ of 0.146 for 2002, suggesting outliers should belong to first and fourth quartiles of observations in 2002.

Overall statistics (Table 2) reveal that on an average, the absolute pricing error is 29.7% with 21.2% median absolute error. In other words, the predicted prices, on an average, are 70.3% accurate when we use $(P/E)_h$ valuation technique. This leads me to a conclusion that on an average, the valuation using $(P/E)_h$ has low predictability. The coefficient of variation $(CV)_h$ of 71.3% for the overall sample indicates that there is a lot of variation. This is also evident from the 29.7% $(MAPE)_h$ with 21.2% $(SPE)_h$ for overall sample as the standard deviation and mean values are quite close. The inter-quartile range $(IQR)_h$ of 0.146 for a mean of 0.297 suggests that the middle fifty observations' spread is low.

Firm-wise analysis for this technique is presented in Table 2a below. We can identify outliers (year-2002) such as Lloyds Equipment Hire/Lloyds British Testing with $(PPE)_h$ of 90%.

Table 2a: Firm wise details of Valuation using $(P/E)_h$
(Data Source: FAME and Datastream)

BUYOUT	P/E CF-1 (j=1)	P/E CF-2 (j=2)	P/E CF-3 (j=3)	H. Mean (B_t)	TF $(EPS)_h$	Predicted Price $B_t*(EPS)_h$	Price after 2 days of listing (P_t)	EXIT YEAR	$(PPE)_h$
Capcon	7.4	8.4	12.4	8.95	4.24	37.93	90.0	2001	0.58
Caffe Nero	8.4	9.2	11.0	9.44	4.20	39.64	53.5	2001	0.26
OMG	9.3	16.3	14.3	12.54	6.34	79.52	83.5	2001	0.05
Parkman Group/Flete Ltd DO NOT CONTACT	13.4	8.3	13.3	11.12	10.20	113.40	148.5	2001	0.24
PHS Holdings	7.2	12.2	14.2	10.34	9.32	96.34	76.5	2001	0.26
Lloyds Equipment Hire/Lloyds British Testing	12.3	7.5	13.5	10.36	4.21	43.63	23.0	2002	0.90

Trecco Bay/Premier Dawn/Parkdean Holidays	17.8	14.3	12.2	14.43	7.40	106.78	112.5	2002	0.05
Corin Medical	11.2	14.5	8.7	11.02	8.82	97.19	129.5	2002	0.25
Smith Group Ltd/Detica	17.4	12.2	14.2	14.30	6.48	92.65	78.3	2002	0.18
Inveresk Research	8.3	9.2	14.3	10.04	1.48	14.85	11.0	2002	0.35
Punch Taverns	15.2	11.3	12.3	12.73	4.20	53.45	47.1	2002	0.14
Testing Services/Intertek	12.2	14.3	17.2	14.29	21.80	311.45	433.5	2002	0.28
HMV Media	12.2	15.3	11.3	12.71	13.20	167.75	177.5	2002	0.05
William Hill	11.3	16.2	14.8	13.77	10.62	146.22	174.1	2002	0.16
Mechan Controls	8.3	7.2	9.1	8.14	3.10	25.24	75.0	2003	0.66
Tellings Golden Miller	11.6	16.4	11.3	12.73	4.10	52.18	77.5	2003	0.33
Sondex	12.8	14.2	15.3	14.04	10.08	141.52	115.9	2003	0.22
Sinclair Pharma	8.4	7.4	12.7	8.99	11.67	104.92	122.5	2003	0.14
Center Parcs	12.3	14.5	9.5	11.73	11.28	132.26	104.5	2003	0.27
Benfield Lovic & Rees/Benfield	17.1	13.5	16.3	15.46	16.20	250.39	280.5	2003	0.11
Yell Group	15.7	14.2	17.2	15.62	16.28	254.32	267.2	2003	0.05
MKM Marketing & Promotions	8.2	7.3	6.3	7.21	3.54	25.52	46.5	2004	0.45
Prologic Computer Consultants	12.5	16.2	17.7	15.16	7.97	120.84	84.5	2004	0.43
Immunodiagnostic Systems/IDS	8.3	13.2	11.2	10.53	8.22	86.59	55.0	2004	0.57
Cambridge Display Technology/CDT	6.5	7.5	7.1	6.99	2.82	19.72	11.6	2004	0.70
SmartFocus	10.2	12.3	7.3	9.50	2.04	19.39	9.6	2004	1.01
Staffline	8.2	11.2	14.2	10.68	6.48	69.22	85.5	2004	0.19

Torex retail business/Lynxangel	13.2	9.2	13.2	11.55	4.31	49.78	60.5	2004	0.18
PKL Holdings	10.3	8.4	7.8	8.70	11.64	101.28	127.5	2004	0.21
ATH Resources	12.2	11.6	9.7	11.05	10.12	111.84	137.5	2004	0.19
NCC Group	11.9	15.3	17.2	14.49	14.32	207.56	176.5	2004	0.18
Pinewood Studios	8.4	10.4	11.5	9.90	15.50	153.47	200.5	2004	0.23
Ratheon Marine/Raymarine	9.3	12.6	15.9	12.01	11.10	133.29	155.0	2004	0.14
Phoenix Computers/Phoenix IT Group	12.2	17.2	14.2	14.26	13.14	187.44	238.5	2004	0.21
Umbro	10.3	9.3	7.4	8.83	10.10	89.14	109.1	2004	0.18
Jessops Limited	13.2	16.3	17.3	15.41	7.80	120.21	156.0	2004	0.23
Dignity Caring Funeral Services/Dignity Services	9.2	11.2	13.5	11.03	17.23	190.00	243.6	2004	0.22
Xyratex	14.2	12.2	11.2	12.44	1.40	17.42	14.0	2004	0.24
Hillsdown/Premier Foods	18.2	13.2	14.2	14.92	8.40	125.35	148.1	2004	0.15
Halfords	14.4	15.2	11.2	13.39	18.20	243.62	265.0	2004	0.08
Admiral Insurance Services	16.7	15.3	17.5	16.46	15.20	250.20	287.0	2004	0.13
Software Radio technology (SRT)	12.8	12.2	15.2	13.30	5.38	71.55	38.5	2005	0.86
NWP Spectrum/Spectrum Interactive	8.2	14.2	12.3	10.96	4.39	48.12	94.5	2005	0.49
Caretech	12.3	15.3	11.3	12.79	7.80	99.79	169.0	2005	0.41
Powerleague	12.2	17.8	14.3	14.43	5.50	79.37	50.0	2005	0.59
London Capital Group	13.5	16.5	17.3	15.55	7.20	111.95	85.5	2005	0.31
Synexus	7.7	10.4	11.2	9.52	5.24	49.91	72.0	2005	0.31

Cyan Technology	8.2	5.5	13.7	7.94	4.12	32.71	24.8	2005	0.32
ReNeuron	13.2	12.9	11.4	12.42	3.50	43.49	26.0	2005	0.67
Lombard Medical (Advanced Medical Technologies)	11.2	14.3	18.3	14.03	9.40	131.86	163.5	2005	0.19
Sarantel	16.2	12.4	9.4	12.02	1.20	14.43	11.4	2005	0.27
La Tasca/The Restaurant People Group	8.4	13.2	12.2	10.84	10.24	111.02	134.0	2005	0.17
Hargreaves (UK)	12.4	8.3	15.3	11.27	17.40	196.13	246.0	2005	0.20
Davenham Group Holdings Limited	15.3	21.2	13.4	16.01	13.20	211.37	261.5	2005	0.19
Land of Leather	13.2	15.3	19.2	15.53	64.00	993.79	1329.7	2005	0.25
Carter & Carter	17.3	13.8	11.4	13.72	17.20	236.07	295.5	2005	0.20
SThree/Solutions in Staffing & Software	18.3	14.5	12.3	14.60	10.32	150.63	204.5	2005	0.26
IG Group (IGGHL)/IG Index	11.2	14.8	17.3	13.99	11.06	154.68	119.8	2005	0.29
Pizza Express (Gondola Express)	16.2	17.3	13.3	15.40	17.60	270.99	326.0	2005	0.17
Inmarsat	16.2	17.2	13.2	15.35	14.92	229.06	288.0	2005	0.20

4.3 Are the results statistically significant?

Values reported in table 3 will be used to evaluate the yearly performer between the $(P/E)_f$ and $(P/E)_h$ valuation approaches. The null hypothesis (H_0) for each year states that there is no statistically significant difference between Predicted Proportional Errors $(PPE)_f$ in valuation using $(P/E)_f$ and Predicted Proportional Errors $(PPE)_h$ in valuation using $(P/E)_h$. For each specified year, pair-wise comparison between the two valuation

techniques is conducted using paired t-test. The p values obtained from the paired t-test are reported first, which when compared with corresponding α value will determine whether we can reject the null hypothesis for alternate hypothesis. In other words, we can determine whether the difference of the proportional predicted error in the techniques statistically significant.

Year	2001	2002	2003	2004	2005	Overall
p-value	0.092	0.072	0.209	2E-04	3E-04	3.39E-08
α-value	0.05	0.05	0.05	0.05	0.05	0.05

Table 3 - Results of Paired T-Test

The maximum confidence we can have that the difference is statistically significant is (1−p) value. The p-value (Table-3) confirms the confidence interval analysis for years 2001, 2002 and 2003 because the corresponding maximum confidence (1-p) for these years is less than 95%. Therefore, I fail to reject the null hypothesis for these years. At a 5% risk of a type I error (α-value = 0.05) I would fail to reject the null hypothesis for years 2001, 2002 and 2003. For years 2004, 2005 and overall sample, the p-values don't confirm the confidence interval analysis because the maximum confidence (1-p) value for these years is greater than 95%. Therefore, at a 5% risk of a type I error (α-value = 0.05 or 95% confidence interval) I would reject the null hypothesis for years 2004, 2005 and overall sample. The alternate hypothesis (H_1) states that there is statistically significant difference between Predicted Proportional Errors $(PPE)_f$ in valuation using $(P/E)_f$ and Predicted Proportional Errors $(PPE)_h$ in valuation using $(P/E)_h$. I accept H_1 for years 2004, 2005 and overall sample.

4.4 Comparison of Valuation techniques

Comparing Table 1 with table 2 reveals some interesting facts. We can see that $(MAPE)_f$ is lower than $(MAPE)_h$ for all the years, showing that valuation using $(P/E)_f$ has higher predictive ability than the valuation using $(P/E)_h$. Also, $(SPE)_h$ is higher than $(SPE)_f$

across all years, reflecting higher intra year variation in $(PPE)_h$ than that in $(PPE)_f$. These results apply across all firm sizes and years, irrespective of prevalent macroeconomic conditions. The results suggest that forward earnings multiple always reflects extra information than historical multiple does carry, and that historical earnings multiples does not have any incremental information, useful for the improvement of the valuation accuracy, beyond forward earnings multiple. This is intuitively appealing from the fact that analysts forecast are themselves based on the historical accounting numbers. Since the difference in MAPE for both techniques is statistically significant (Table 3), the conclusion is highly useful for our interest group of UK analysts. I recommend that they should prefer valuation using $(P/E)_f$ to $(P/E)_h$ to achieve higher accuracy. Our results are consistent with those of Liu, 2002 and Yong, 2006. For the overall sample, 0.139 $(IQR)_f$ against 0.146 $(IQR)_h$ shows that middle fifty observation range is more disperse for valuation using $(P/E)_h$.

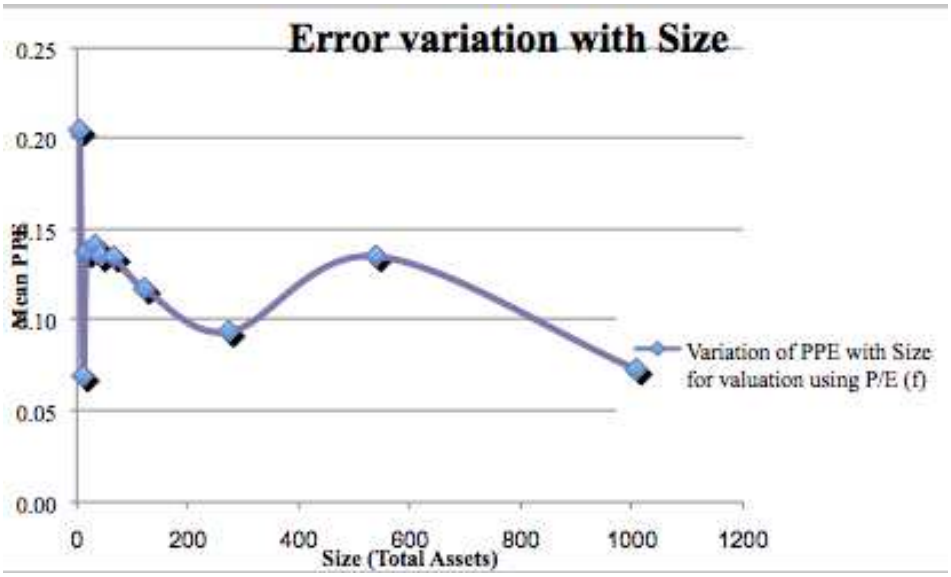
4.5 Variation of Valuation accuracy with Target firm Size

The fourth stage has been sub divided in to two parts. While the first part shows the variation of PPE with TA for $(P/E)_f$ approach, the second shows the same for $(P/E)_h$ technique. For the first part, all 60 companies of the original sample are divided into 10 equal groups (deciles) based on size. Group 1 represents smallest 6 firms and group 2 is the next higher in terms of firm size. Likewise, all other deciles have been constructed. The Mean of $(PPE)_f$ has been calculated for all deciles (Table-4a). Mean value of TA for each of the deciles is also presented. Further details about the firms in the deciles are available in Table 4b.

Deciles	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Mean (TA)	5	11	17	33	43	67	122	274	539	1008
Mean $(PPE)_f$	0.20	0.07	0.14	0.14	0.14	0.13	0.12	0.09	0.14	0.07

Table 4a – Variation of TA with $(PPE)_f$

From table 4a, we can observe that except deciles 2 and 9, all others deciles show a negative variation of mean $(PPE)_f$ with mean TA. Therefore, we can conclude that on an average, $(PPE)_f$ and TA show an inverse relation. The slope of Plot-2 shows an abrupt variation of $(PPE)_h$ for small size deciles, which is due to sudden decline in mean $(PPE)_f$ for 2nd decile.



Plot 1 - Chart plotted from Table-4a data showing variation of Mean $(PPE)_f$ with Mean TA

We can also notice a sharp decline of mean $(PPE)_f$ for the deciles that have small mean TA. This means that the $(PPE)_f$ is extremely sensitive to small firm sizes. In other words, we can say that on an average, $(PPE)_f$ declines at a faster pace for small firms than large ones. Analyzing the 2nd decile in Table 4b, we can identify firms with highly accurate predictions that were responsible for sudden drop in $(PPE)_f$ value. These are Immunodiagnostic Systems/IDS, Powerleague, London capital group and Tellings Golden Miller with 0.0%, 4%, 0.0% and 1% $(PPE)_f$ value respectively.

Table 4b - Information on size deciles for valuation using $(P/E)_f$
(Source: Offer Documents, Datastream and FAME)

BUYOUT	Placing Price $(P/E)_{jf}$*$(EPS)_{jf}$	Price after 2 days of listing (P_{jt})	Total Assets (TA)	EXIT YEAR	$(PPE)_{jf}$
Mechan Controls	57.0	75.0	1.5	2003	0.24
Software Radio technology (SRT)	31.0	38.5	4.0	2005	0.19
Capcon	80.0	90.0	5.8	2001	0.11
MKM Marketing & Promotions	36.0	46.5	5.8	2004	0.23
NWP Spectrum/Spectrum Interactive	62.0	94.5	6.5	2005	0.34
Prologic Computer Consultants	75.0	84.5	6.5	2004	0.11
Lloyds Equipment Hire/Lloyds British Testing	20.5	23.0	6.8	2002	0.11
Immunodiagnostic Systems/IDS	55.0	55.0	7.4	2004	0.00
Caretech	125.0	169.0	11.3	2005	0.26
Powerleague	48.0	50.0	12.5	2005	0.04
London Capital Group	85.5	85.5	15.0	2005	0.00

Tellings Golden Miller	78.0	77.5	15.3	2003	0.01
Cambridge Display Technology/CDT	11.3	11.6	15.4	2004	0.03
Synexus	65.0	72.0	15.7	2005	0.10
SmartFocus	6.3	9.6	16.0	2004	0.34
Staffline	72.0	85.5	16.7	2004	0.16
Cyan Technology	22.0	24.8	18.6	2005	0.11
Torex retail business/Lynxangel	55.0	60.5	22.5	2004	0.09
ReNeuron	25.0	26.0	23.4	2005	0.04
Trecco Bay/Premier Dawn/Parkdean Holidays	100.0	112.5	32.4	2002	0.11
Caffe Nero	50.0	53.5	33.7	2001	0.07
OMG	75.0	83.5	36.7	2001	0.10
Lombard Medical (Advanced Medical Technologies)	123.0	163.5	37.0	2005	0.25
Sondex	83.0	115.9	38.8	2003	0.28
Corin Medical	111.0	129.5	39.0	2002	0.14
PKL Holdings	102.0	127.5	40.0	2004	0.20
ATH Resources	135.0	137.5	40.2	2004	0.02
Sarantel	10.1	11.4	43.0	2005	0.11
Parkman Group/Flete Ltd DO NOT CONTACT	125.0	148.5	43.8	2001	0.16
La Tasca/The Restaurant People Group	110.0	134.0	54.0	2005	0.18
Hargreaves (UK)	243.0	246.0	57.5	2005	0.01
Sinclair Pharma	80.0	122.5	62.0	2003	0.35
NCC Group	170.0	176.5	65.0	2004	0.04
Davenham Group Holdings Limited	254.0	261.5	65.2	2005	0.03
Land of Leather	1247.9	1329.7	77.6	2005	0.06
Carter & Carter	200.0	295.5	78.4	2005	0.32
Pinewood Studios	180.0	200.5	82.5	2004	0.10
Smith Group Ltd/Detica	98.0	78.3	88.0	2002	0.25
Ratheon Marine/Raymarine	160.5	155.0	125.5	2004	0.04
Phoenix Computers/Phoenix IT Group	200.0	238.5	133.0	2004	0.16
Umbro	100.0	109.1	144.5	2004	0.08
Jessops Limited	145.0	156.0	159.0	2004	0.07
Dignity Caring Funeral Services/Dignity Services	239.9	243.6	184.0	2004	0.01
Xyratex	14.0	14.0	213.0	2004	0.00
SThree/Solutions in Staffing & Software	190.0	204.5	275.0	2005	0.07
Center Parcs	83.0	104.5	285.0	2003	0.21
Inveresk Research	13.0	11.0	299.0	2002	0.18
IG Group (IGGHL)/IG Index	130.0	119.8	393.0	2005	0.09
PHS Holdings	93.5	76.5	414.0	2001	0.22

Hillsdown/Premier Foods	145.4	148.1	527.0	2004	0.02
Pizza Express (Gondola Express)	270.0	326.0	559.0	2005	0.17
Punch Taverns	44.7	47.1	570.0	2002	0.05
Benfield Lovic & Rees/Benfield	230.0	280.5	575.0	2003	0.18
Halfords	220.0	265.0	593.0	2004	0.17
Testing Services/Intertek	400.0	433.5	614.0	2002	0.08
HMV Media	192.0	177.5	656.2	2002	0.08
Admiral Insurance Services	275.0	287.0	711.0	2004	0.04
William Hill	158.9	174.1	949.0	2002	0.09
Inmarsat	245.0	288.0	1119.0	2005	0.15
Yell Group	267.2	267.2	2000.0	2003	0.00

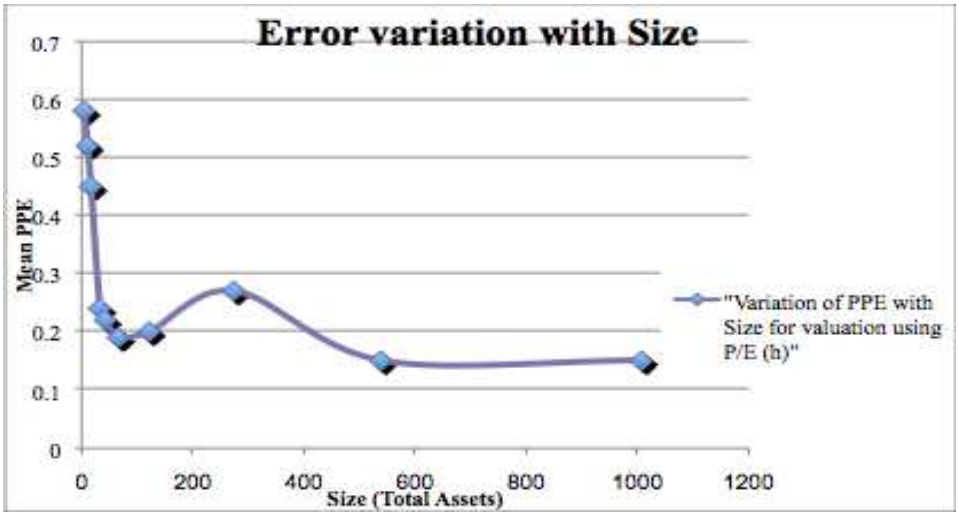
Key –Table 4b comprises 10 groups, each having 6 firms in it. These are categorized in ascending order of firm sizes as measured by total assets. Top group that is highlighted is the 1st decile, next non-highlighted is 2nd decile and so on.

Similarly, for the second part, I have divided all 60 companies of the original sample into 10 equal groups (deciles) based on size. Group 1 represents smallest 6 firms and group 2 is the next higher in terms of firm size. Likewise, all other deciles have been constructed. The Mean of $(PPE)_h$ has been calculated for all deciles (Table-4c). Mean value of TA for each of the deciles is also shown in table-4c. The detailed analysis of firm deciles and corresponding $(PPE)_h$ values are presented in table-4d.

Deciles	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Mean (TA)	5	11	17	33	43	67	122	274	539	1008
Mean $(PPE)_h$	0.58	0.52	0.45	0.24	0.22	0.19	0.20	0.27	0.15	0.15

Table 4c – Variation of TA with $(PPE)_h$

From the graph plotted using table-4c data, we can observe that the deciles with lower mean size (TA) have higher mean $(PPE)_h$. Therefore, we can conclude that on an average, $(PPE)_h$ and TA show an inverse relation. The slope of Plot-2 shows a steep decline in $(PPE)_h$ for small size deciles, which later becomes stable for groups that have higher mean TA.



Plot 2 - Chart plotted from Table-4c data showing variation of Mean $(PPE)_h$ with Mean TA

This means that the $(PPE)_h$ is most sensitive to small size firms. In other words, we can say that on an average, $(PPE)_h$ declines at a faster pace for small firms than large ones. Since for this technique we selected firms on the basis of Industry and ROE, the result implies that the effectiveness of Industry and ROE as proxies for business risk and return is higher for large firms than small ones.

Table 4d : Information on size deciles for valuation using $(P/E)_h$
(Data Source: FAME and Datastream)

BUYOUT	P/E CF 1	P/E CF 2	P/E CF 3	H Mean (B_t)	TF $(EPS)_h$	Predicted Price B_t*$(EPS)_h$	Price after 2 days of listing (P_t)	TA	EXIT YEAR	$(PPE)_h$
Mechan Controls	8.3	7.2	9.1	8.1	3.1	25.2	75.0	1.5	2003	0.66
Software Radio technology (SRT)	12.8	12.2	15.2	13.3	5.4	71.5	38.5	4.04	2005	0.86
Capcon	7.4	8.4	12.4	8.9	4.2	37.9	90.0	5.75	2001	0.58
MKM Marketing & Promotions	8.2	7.3	6.3	7.2	3.5	25.5	46.5	5.8	2004	0.45
NWP Spectrum/Spectrum Interactive	8.2	14.2	12.3	11.0	4.4	48.1	94.5	6.5	2005	0.49
Prologic Computer Consultants	12.5	16.2	17.7	15.2	8.0	120.8	84.5	6.53	2004	0.43
Lloyds Equipment Hire/Lloyds British Testing	12.3	7.5	13.5	10.4	4.2	43.6	23.0	6.8	2002	0.90

Immunodiagnostic Systems/IDS	8.3	13.2	11.2	10.5	8.2	86.6	55.0	7.4	2004	0.57
Caretech	12.3	15.3	11.3	12.8	7.8	99.8	169.0	11.3	2005	0.41
Powerleague	12.2	17.8	14.3	14.4	5.5	79.4	50.0	12.5	2005	0.59
London Capital Group	13.5	16.5	17.3	15.5	7.2	112.0	85.5	15	2005	0.31
Tellings Golden Miller	11.6	16.4	11.3	12.7	4.1	52.2	77.5	15.3	2003	0.33
Cambridge Display Technology/CDT	6.5	7.5	7.1	7.0	2.8	19.7	11.6	15.4	2004	0.70
Synexus	7.7	10.4	11.2	9.5	5.2	49.9	72.0	15.7	2005	0.31
SmartFocus	10.2	12.3	7.3	9.5	2.0	19.4	9.6	16	2004	1.01
Staffline	8.2	11.2	14.2	10.7	6.5	69.2	85.5	16.7	2004	0.19
Cyan Technology	8.2	5.5	13.7	7.9	4.1	32.7	24.8	18.6	2005	0.32
Torex retail business/Lynxangel	13.2	9.2	13.2	11.5	4.3	49.8	60.5	22.5	2004	0.18
ReNeuron	13.2	12.9	11.4	12.4	3.5	43.5	26.0	23.4	2005	0.67
Trecco Bay/Premier Dawn/Parkdean Holidays	17.8	14.3	12.2	14.4	7.4	106.8	112.5	32.4	2002	0.05
Caffe Nero	8.4	9.2	11.0	9.4	4.2	39.6	53.5	33.7	2001	0.26
OMG	9.3	16.3	14.3	12.5	6.3	79.5	83.5	36.7	2001	0.05
Lombard Medical (Advanced Medical Technologies)	11.2	14.3	18.3	14.0	9.4	131.9	163.5	37	2005	0.19
Sondex	12.8	14.2	15.3	14.0	10.1	141.5	115.9	38.8	2003	0.22
Corin Medical	11.2	14.5	8.7	11.0	8.8	97.2	129.5	39	2002	0.25
PKL Holdings	10.3	8.4	7.8	8.7	11.6	101.3	127.5	40	2004	0.21
ATH Resources	12.2	11.6	9.7	11.1	10.1	111.8	137.5	40.2	2004	0.19
Sarantel	16.2	12.4	9.4	12.0	1.2	14.4	11.4	43	2005	0.27
Parkman Group/Flete Ltd DO NOT CONTACT	13.4	8.3	13.3	11.1	10.2	113.4	148.5	43.8	2001	0.24
La Tasca/The Restaurant People Group	8.4	13.2	12.2	10.8	10.2	111.0	134.0	54	2005	0.17
Hargreaves (UK)	12.4	8.3	15.3	11.3	17.4	196.1	246.0	57.5	2005	0.20
Sinclair Pharma	8.4	7.4	12.7	9.0	11.7	104.9	122.5	62	2003	0.14
NCC Group	11.9	15.3	17.2	14.5	14.3	207.6	176.5	65	2004	0.18
Davenham Group Holdings Limited	15.3	21.2	13.4	16.0	13.2	211.4	261.5	65.2	2005	0.19
Land of Leather	13.2	15.3	19.2	15.5	64.0	993.8	1329.7	77.6	2005	0.25
Carter & Carter	17.3	13.8	11.4	13.7	17.2	236.1	295.5	78.4	2005	0.20
Pinewood Studios	8.4	10.4	11.5	9.9	15.5	153.5	200.5	82.5	2004	0.23
Smith Group Ltd/Detica	17.4	12.2	14.2	14.3	6.5	92.7	78.3	88	2002	0.18

Ratheon Marine/Raymarine	9.3	12.6	15.9	12.0	11.1	133.3	155.0	126	2004	0.14
Phoenix Computers/Phoenix IT Group	12.2	17.2	14.2	14.3	13.1	187.4	238.5	133	2004	0.21
Umbro	10.3	9.3	7.4	8.8	10.1	89.1	109.1	145	2004	0.18
Jessops Limited	13.2	16.3	17.3	15.4	7.8	120.2	156.0	159	2004	0.23
Dignity Caring Funeral Services/Dignity Services	9.2	11.2	13.5	11.0	17.2	190.0	243.6	184	2004	0.22
Xyratex	14.2	12.2	11.2	12.4	1.4	17.4	14.0	213	2004	0.24
SThree/Solutions in Staffing & Software	18.3	14.5	12.3	14.6	10.3	150.6	204.5	275	2005	0.26
Center Parcs	12.3	14.5	9.5	11.7	11.3	132.3	104.5	285	2003	0.27
Inveresk Research	8.3	9.2	14.3	10.0	1.5	14.9	11.0	299	2002	0.35
IG Group (IGGHL)/IG Index	11.2	14.8	17.3	14.0	11.1	154.7	119.8	393	2005	0.29
PHS Holdings	7.2	12.2	14.2	10.3	9.3	96.3	76.5	414	2001	0.26
Hillsdown/Premier Foods	18.2	13.2	14.2	14.9	8.4	125.4	148.1	527	2004	0.15
Pizza Express (Gondola Express)	16.2	17.3	13.3	15.4	17.6	271.0	326.0	559	2005	0.17
Punch Taverns	15.2	11.3	12.3	12.7	4.2	53.4	47.1	570	2002	0.14
Benfield Lovic & Rees/Benfield	17.1	13.5	16.3	15.5	16.2	250.4	280.5	575	2003	0.11
Halfords	14.4	15.2	11.2	13.4	18.2	243.6	265.0	593	2004	0.08
Testing Services/Intertek	12.2	14.3	17.2	14.3	21.8	311.5	433.5	614	2002	0.28
HMV Media	12.2	15.3	11.3	12.7	13.2	167.8	177.5	656	2002	0.05
Admiral Insurance Services	16.7	15.3	17.5	16.5	15.2	250.2	287.0	711	2004	0.13
William Hill	11.3	16.2	14.8	13.8	10.6	146.2	174.1	949	2002	0.16
Inmarsat	16.2	17.2	13.2	15.4	14.9	229.1	288.0	1119	2005	0.20
Yell Group	15.7	14.2	17.2	15.6	16.3	254.3	267.2	2000	2003	0.05

Key – Table-4d comprises 10 groups, each having 6 firms in it. These are categorized in ascending order of firm sizes as measured by total assets. Top group that is highlighted is the 1st decile, next non-highlighted is 2nd decile and so on.

Analyzing the 8th decile in Table 4d, we can identify firms with low accurate predictions that were responsible for sudden rise in $(PPE)_h$ value. These are Inveresk Research, IG Group, Center Parcs and SThree with 35%, 29%, 27% and 26% $(PPE)_h$ value respectively.

These results have practical implications for our interest groups. We see that valuations for small firms are most sensitive. The PPE for a small size firm will be higher than that of a big firm for the similar deviation of comparable firm from its target. The result is important for UK based analysts who should treat valuations of small size firms in a careful manner to avoid large valuation errors. Our results about negative variation of PPE with firm size for UK markets are consistent with those of Alford (1992) for US markets.

5.0 Conclusion

This paper examines 89 UK buyouts to estimate the accuracy of their equity valuation using Price-Earnings (P/E) multiple, a procedure that is widely recommended by academics and practitioners. I examine the accuracy of valuation using P/E constructed with both the trailing $(P/E)_h$ and forward $(P/E)_f$ earnings. The absolute tests of accuracy reveal that on an average, the valuation using $(P/E)_h$ is 70.3% accurate when comparable firms are chosen on the basis of Industry and ROE. Tests also reveal that on an average, the valuation using $(P/E)_f$ is 87.6% accurate. While there are few inter year variations in valuation accuracy for individual techniques, the valuation accuracy with $(P/E)_f$ has consistently been higher than that with $(P/E)_h$. The results show that forecasts improve the valuation accuracy substantially. The standard deviation for the former is 21.2% v/s 9.5% for the later, showing that with in the sample, the variation of Predicted Proportional Error (PPE) is higher for valuation using $(P/E)_h$ than that using $(P/E)_f$. Hypothesis testing using Paired T-Test (95% confidence interval) is conducted both on yearly and overall data to evaluate whether there is any statistical significant difference in PPE recorded for the techniques. I find that there is no statistically significant difference between $(PPE)_f$ and $(PPE)_h$ for years 2001, 2002 and 2003. However, there is statistically significant difference between $(PPE)_f$ and $(PPE)_h$ for years 2004, 2005 and overall sample. These findings imply that $(P/E)_f$ contains incremental information not captured by $(P/E)_h$. The result is important for the investment bankers/analysts working in the UK in that they can do superior fundamental analysis with $(P/E)_f$. Therefore, they should always forecast financials to use $(P/E)_f$ rather $(P/E)_h$ to value any firm. The results for UK markets are in line with those of Liu, 2002 and Yong, 2006 for US markets.

Finally, the tests on UK market indicate that on an average, valuation accuracy increases with target firm's size. This conclusion for UK markets is applicable to both the valuation using $(P/E)_h$ and $(P/E)_f$. This is consistent with the results obtained by Alford for US markets. Further, when the sample is divided in to deciles based on size and plotted against the PPE, I find that and that the PPE is more sensitive to small firms than the large for both the techniques. In other words, PPE drops at a faster rate for firms that have small size (TA), implying that the efficacy of selecting comparable firms on the basis of industry and ROE is greater for large firms than for small firms. Again, the result is important for UK based analysts who should treat valuations of small size UK firms with utmost care because they are most sensitive to error. As a caveat, I recognize that my study deals with a small sample size of 89 firms, and thus may have missed more clear patterns that are apparent only in large sample studies. This possibility is still open to explore. Also, I understand that any linear combination of $(P/E)_f$ and $(P/E)_h$ cannot improve valuation accuracy beyond that obtained by $(P/E)_f$ multiple. Therefore, I recognize that there is a possibility and further research scope for developing some nonlinear combination of $(P/E)_h$ and $(P/E)_f$ that can improve valuation accuracy beyond $(P/E)_f$ multiple alone. Also, reasons for the presence of outliers can be explored.

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7.0 Appendices

Appendix 1: Initial Sample of 89 Buyouts.
(Source : CMBOR)

S.No.	BUYOUT	Activity	EXITYEAR
1	Video Box Office/Home Entertainment Corp	Media	2001
2	OMG	Media	2001
3	Parkman Group/Flete Ltd DO NOT CONTACT	Business services, leasing	2001
4	Smiles Brewing Company	Drink	2001
5	Capcon	Business services, leasing	2001
6	Caffe Nero	Hotels, Catering & Leisure	2001
7	PHS Holdings	Business services, leasing	2001
8	Willis Corroon	Banking, insurance & finance	2001
9	HMV Media	Retail distribution & repair	2002
10	Strategies Group	Internet Technology	2002
11	Trecco Bay/Premier Dawn/Parkdean Holidays	Hotels, Catering & Leisure	2002
12	Punch Taverns	Hotels, Catering & Leisure	2002
13	Inveresk Research	Business services, leasing	2002
14	Lloyds Equipment Hire/Lloyds British Testing	Business services, leasing	2002
15	Hyder Consulting	Business services, leasing	2002
16	William Hill	Hotels, Catering & Leisure	2002
17	Smith Group Ltd/Detica	Computer:Services	2002
18	Memory Lane Cakes Ltd/Finsbury Food Group	Food	2002
19	Debt Free Direct	Banking, insurance & finance	2002
20	Testing Services/Intertek	Business services, leasing	2002
21	Corin Medical	Other manufacturing	2002
22	Center Parcs	Hotels, Catering & Leisure	2003
23	Bybrook	Media	2003
24	The Tanfield Group/E2A Ltd	Mechanical & instrument eng.	2003
25	Tellings Golden Miller	Transport & communication	2003
26	Benfield Lovic & Rees/Benfield	Banking, insurance & finance	2003
27	Yell Group	Business services, leasing	2003
28	Sinclair Pharma	Medical:Pharmaceutical	2003
29	Mechan Controls	Electrical eng. & Electronics	2003
30	Readymatch/Vista Group	Other manufacturing	2003

31	Wellington RE/Exali Reinsurance Holdings/Aspen	Banking, insurance & finance	2003
32	Sondex	Mechanical & instrument eng.	2003
33	Bencard Allergy Business/Allergy Therapeutics	Medical:Pharmaceutical	2004
34	Prologic Computer Consultants	Computer:Software	2004
35	Admiral Insurance Services	Banking, insurance & finance	2004
36	Monkton Group	Energy	2004
37	Marconi Applied Technology/e2v technologies ltd	Electrical eng. & Electronics	2004
38	Staffline	Business services, leasing	2004
39	Hillsdown/Premier Foods	Food	2004
40	Umbro	Leather, footwear & clothing	2004
41	Rebus	Computer:Software	2004
42	ATH Resources	Extraction of ore and minerals	2004
43	Cambridge Display Technology/CDT	Electrical eng. & Electronics	2004
44	NCC Group	Computer:Software	2004
45	ArmorGroup/Armor Products International	Business services, leasing	2004
46	Phoenix Computers/Phoenix IT Group	Computer:Hardware	2004
47	Freedom Group/Spice Holdings	Construction	2004
48	Immunodiagnostic Systems/IDS	Medical:Healthcare	2004
49	PKL Holdings	Wholesale distribution	2004
50	Torex retail business/Lynxangel	Computer:Software	2004
51	SmartFocus	Computer:Software	2004
52	Software Dialog & Panda/Formjet	Computer:Software	2004
53	Xyratex	Computer:Hardware	2004
54	GOALS (Glasgow Open Air Leisure)/Fortis Leisure	Hotels, Catering & Leisure	2004
55	Dignity Caring Funeral Services/Dignity Services	Business services, leasing	2004
56	Ratheon Marine/Raymarine	Mechanical & instrument eng.	2004
57	Banner Business Supplies/O2O/office2office	Wholesale distribution	2004
58	Supply Desk/Project Socrates/Public Recruitment Group	Business services, leasing	2004
59	Star Energy/Soco	Energy	2004
60	British Biocell International (BBI)	Other manufacturing	2004
61	Halfords	Retail distribution & repair	2004
62	MKM Marketing & Promotions	Media	2004
63	Jessops Limited	Retail distribution & repair	2004
64	Pinewood Studios	Media	2004

65	London Capital Group	Hotels, Catering & Leisure	2005
66	Fonebak	Telecommunications	2005
67	Software Radio technology (SRT)	Computer:Software	2005
68	Caretech	Medical:Healthcare	2005
69	NWP Spectrum/Spectrum Interactive	Telecommunications	2005
70	Merant Micro Focus	Computer:Software	2005
71	Metallurgical Chemicals Division/Foseco	Chemicals & m-m-f	2005
72	Carter & Carter	Transport & communication	2005
73	Cyan Technology	Telecommunications	2005
74	Synexus	Medical:Pharmaceutical	2005
75	Honeysuckle Group	Leather, footwear & clothing	2005
76	Powerleague	Hotels, Catering & Leisure	2005
77	Pizza Express (Gondola Express)	Hotels, Catering & Leisure	2005
78	Hargreaves (UK)	Business services, leasing	2005
79	ReNeuron	Biotechnology	2005
80	Davenham Group Holdings Limited	Banking, insurance & finance	2005
81	Rank Hovis McDougall/ RHM	Food	2005
82	La Tasca/The Restaurant People Group	Hotels, Catering & Leisure	2005
83	Land of Leather	Retail distribution & repair	2005
84	IG Group (IGGHL)/IG Index	Hotels, Catering & Leisure	2005
85	RAL Holdings/Quicksilver	Hotels, Catering & Leisure	2005
86	Sarantel	Telecommunications	2005
87	Lombard Medical (Advanced Medical Technologies)	Medical:Healthcare	2005
88	SThree/Solutions in Staffing & Software	Computer:Services	2005
89	Inmarsat	Telecommunications	2005

Appendix 1a: Filtered Sample of 60 Firms.

S.No.	BUYOUT	activity	EXITYEAR
1	Capcon	Banking, insurance & finance	2001
2	Caffe Nero	Banking, insurance & finance	2001
3	OMG	Banking, insurance & finance	2001
4	Parkman Group/Flete Ltd DO NOT CONTACT	Biotechnology	2001
5	PHS Holdings	Business services, leasing	2001
6	Lloyds Equipment Hire/Lloyds British Testing	Business services, leasing	2002
7	Trecco Bay/Premier Dawn/Parkdean Holidays	Business services, leasing	2002
8	Corin Medical	Business services, leasing	2002
9	Smith Group Ltd/Detica	Business services, leasing	2002
10	Inveresk Research	Business services, leasing	2002
11	Punch Taverns	Business services, leasing	2002
12	Testing Services/Intertek	Business services, leasing	2002
13	HMV Media	Business services, leasing	2002
14	William Hill	Business services, leasing	2002
15	Mechan Controls	Computer:Hardware	2003
16	Tellings Golden Miller	Computer:Hardware	2003
17	Sondex	Computer:Services	2003
18	Sinclair Pharma	Computer:Services	2003
19	Center Parcs	Computer:Software	2003
20	Benfield Lovic & Rees/Benfield	Computer:Software	2003
21	Yell Group	Computer:Software	2003
22	MKM Marketing & Promotions	Computer:Software	2004
23	Prologic Computer Consultants	Computer:Software	2004
24	Immunodiagnostic Systems/IDS	Electrical eng. & Electronics	2004
25	Cambridge Display Technology/CDT	Electrical eng. & Electronics	2004
26	SmartFocus	Extraction of ore and minerals	2004
27	Staffline	Food	2004
28	Torex retail business/Lynxangel	Hotels, Catering & Leisure	2004
29	PKL Holdings	Hotels, Catering & Leisure	2004
30	ATH Resources	Hotels, Catering & Leisure	2004
31	NCC Group	Hotels, Catering & Leisure	2004
32	Pinewood Studios	Hotels, Catering & Leisure	2004
33	Ratheon Marine/Raymarine	Hotels, Catering & Leisure	2004

34	Phoenix Computers/Phoenix IT Group	Hotels, Catering & Leisure	2004
35	Umbro	Hotels, Catering & Leisure	2004
36	Jessops Limited	Hotels, Catering & Leisure	2004
37	Dignity Caring Funeral Services/Dignity Services	Hotels, Catering & Leisure	2004
38	Xyratex	Leather, footwear & clothing	2004
39	Hillsdown/Premier Foods	Mechanical & instrument eng.	2004
40	Halfords	Mechanical & instrument eng.	2004
41	Admiral Insurance Services	Media	2004
42	Software Radio technology (SRT)	Media	2005
43	NWP Spectrum/Spectrum Interactive	Media	2005
44	Caretech	Medical:Healthcare	2005
45	Powerleague	Medical:Healthcare	2005
46	London Capital Group	Medical:Healthcare	2005
47	Synexus	Medical:Pharmaceutical	2005
48	Cyan Technology	Medical:Pharmaceutical	2005
49	ReNeuron	Other manufacturing	2005
50	Lombard Medical (Advanced Medical Technologies)	Retail distribution & repair	2005
51	Sarantel	Retail distribution & repair	2005
52	La Tasca/The Restaurant People Group	Retail distribution & repair	2005
53	Hargreaves (UK)	Retail distribution & repair	2005
54	Davenham Group Holdings Limited	Telecommunications	2005
55	Land of Leather	Telecommunications	2005
56	Carter & Carter	Telecommunications	2005
57	SThree/Solutions in Staffing & Software	Telecommunications	2005
58	IG Group (IGGHL)/IG Index	Transport & communication	2005
59	Pizza Express (Gondola Express)	Transport & communication	2005
60	Inmarsat	Wholesale distribution	2005

Appendix 2 : Information on Primary SIC, Economic activity & Exit.
(Source: FAME and CMBOR)

BUYOUT	Primary SIC	activity	EXIT
Capcon	7412	Business services, leasing	AIM or OTC
Caffe Nero	5530	Hotels, Catering & Leisure	Stock Exchange
OMG	7222	Media	AIM or OTC
Parkman Group/Flete Ltd DO NOT CONTACT	7420	Business services, leasing	Stock Exchange
PHS Holdings	4533	Business services, leasing	Stock Exchange
Lloyds Equipment Hire/Lloyds British Testing	7420	Business services, leasing	AIM or OTC
Trecco Bay/Premier Dawn/Parkdean Holidays	5522	Hotels, Catering & Leisure	Stock Exchange
Corin Medical	7450	Other manufacturing	Stock Exchange
Smith Group Ltd/Detica	7222	Computer:Services	Stock Exchange
Inveresk Research	2112	Business services, leasing	USM or EASDAQ or NASDAQ
Punch Taverns	5540	Hotels, Catering & Leisure	Stock Exchange
Testing Services/Intertek	7430	Business services, leasing	Stock Exchange
HMV Media	5248	Retail distribution & repair	Stock Exchange
William Hill	9271	Hotels, Catering & Leisure	Stock Exchange
Mechan Controls	3330	Electrical eng. & Electronics	USM or EASDAQ or NASDAQ
Tellings Golden Miller	6021	Transport & communication	AIM or OTC
Sondex	3320	Mechanical & instrument eng.	Stock Exchange
Sinclair Pharma	2441	Medical:Pharmaceutical	Stock Exchange
Center Parcs	7415	Hotels, Catering & Leisure	AIM or OTC
Benfield Lovic & Rees/Benfield	6603	Banking, insurance & finance	Stock Exchange
Yell Group	7440	Business services, leasing	Stock Exchange
MKM Marketing & Promotions	7440	Media	AIM or OTC
Prologic Computer Consultants	7260	Computer:Software	AIM or OTC
Immunodiagnostic Systems/IDS	3310	Medical:Healthcare	AIM or OTC
Cambridge Display Technology/CDT	7310	Electrical eng. & Electronics	USM or EASDAQ or NASDAQ
SmartFocus	7222	Computer:Software	AIM or OTC
Staffline	7450	Business services, leasing	AIM or OTC
Torex retail business/Lynxangel	7260	Computer:Software	AIM or OTC
PKL Holdings	9305	Wholesale distribution	AIM or OTC
ATH Resources	1010	Extraction of ore and minerals	AIM or OTC
NCC Group	7222	Computer:Software	AIM or OTC
Pinewood Studios	9211	Media	Stock Exchange
Ratheon Marine/Raymarine	3320	Mechanical & instrument eng.	Stock Exchange
Phoenix Computers/Phoenix IT Group	7222	Computer:Hardware	Stock Exchange

Umbro	1822	Leather, footwear & clothing	Stock Exchange
Jessops Limited	5248	Retail distribution & repair	Stock Exchange
Dignity Caring Funeral Services/Dignity Services	7415	Business services, leasing	Stock Exchange
Xyratex	7430	Computer:Hardware	USM or EASDAQ or NASDAQ
Hillsdown/Premier Foods	1589	Food	Stock Exchange
Halfords	5030	Retail distribution & repair	Stock Exchange
Admiral Insurance Services	6603	Banking, insurance & finance	Stock Exchange
Software Radio technology (SRT)	7260	Computer:Software	AIM or OTC
NWP Spectrum/Spectrum Interactive	6420	Telecommunications	AIM or OTC
Caretech	8532	Medical:Healthcare	AIM or OTC
Powerleague	9262	Hotels, Catering & Leisure	AIM or OTC
London Capital Group	6713	Hotels, Catering & Leisure	AIM or OTC
Synexus	8512	Medical:Pharmaceutical	AIM or OTC
Cyan Technology	3210	Telecommunications	AIM or OTC
ReNeuron	7310	Biotechnology	AIM or OTC
Lombard Medical (Advanced Medical Technologies)	3310	Medical:Healthcare	AIM or OTC
Sarantel	3210	Telecommunications	AIM or OTC
La Tasca/The Restaurant People Group	5540	Hotels, Catering & Leisure	AIM or OTC
Hargreaves (UK)	6024	Business services, leasing	AIM or OTC
Davenham Group Holdings Limited	6713	Banking, insurance & finance	AIM or OTC
Land of Leather	5244	Retail distribution & repair	Stock Exchange
Carter & Carter	8042	Transport & communication	Stock Exchange
SThree/Solutions in Staffing & Software	7450	Computer:Services	Stock Exchange
IG Group (IGGHL)/IG Index	9271	Hotels, Catering & Leisure	Stock Exchange
Pizza Express (Gondola Express)	7415	Hotels, Catering & Leisure	Stock Exchange
Inmarsat	6420	Telecommunications	Stock Exchange